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 TOSHIBA KK *JP 2004210597-A
 2003.01.06 2003-000114(+2003JP-000114) (2004.07.29) C01B 3/02,
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 Exhaust heat utilizing hydrogen-oxygen system has water vapor-
 electric power generating unit, water electrolysis unit, pure
 hydrogen and oxygen liquefiers, nitrogen re-liquefier and liquid
 hydrogen and liquid oxygen storage tanks
 C2004-201267

NOVELTY

Exhaust heat utilizing hydrogen-oxygen system has water vapor-
 electric power-generating unit (1), exhaust heat utilizing heat electric
 power generating unit (5), water electrolysis unit (10), pure hydrogen
 liquefier (16) and oxygen liquefier (12), nitrogen re-liquefier (17) and
 liquid hydrogen storage tank (18) and liquid oxygen storage tank (14).
 The water electrolysis unit has a water purifier (13) for supplying pure
 water (25).

DETAILED DESCRIPTION

An exhaust heat utilizing hydrogen-oxygen system has a water
 vapor-electric power-generating unit (1), an exhaust heat utilizing heat
 electric power generating unit (5), a water electrolysis unit (10), a pure

E(11-N, 31-A2, 31-A3, 31-A5, 31-D1, 31-D2) H(6-A3)
 L(3-E4)

hydrogen liquefier (16) and an oxygen liquefier (12), a nitrogen re-
 liquefier (17), and a liquid hydrogen storage tank (18) and a liquid
 oxygen storage tank (14). The water electrolysis unit has a water
 purifier for supplying pure water. Water vapor and electric power are
 produced in the water vapor-electric power-generating unit. Electric
 power and coolant (23) are produced in the exhaust heat utilizing heat
 electric power generating unit using an operating medium having a
 boiling point lower than water and exhaust gas from the water vapor-
 electric power-generating unit. The electric power from the water
 vapor-electric power-generating unit and the exhaust heat utilizing
 heat electric power generating unit are purified in the water purifier
 and electrolyzed in the water electrolysis unit. The hydrogen gas and
 oxygen gas from the water electrolysis unit are cooled and liquefied in
 the respective liquefiers using coolant produced in the exhaust heat
 utilizing heat electric power generating unit, and stored in the
 respective storage tanks. The cooled hydrogen gas (30, 34) is liquefied
 again in the nitrogen re-liquefier, by circulating liquid nitrogen (31).
 An INDEPENDENT CLAIM is also included for the manufacture of
 liquid hydrogen involving pressurizing liquid hydrogen (33, 35) stored
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in the liquid hydrogen storage tank of an exhaust-heat utilizing hydrogen-oxygen system, and carrying out adiabatic expansion to obtain liquid hydrogen. The hydrogen-oxygen system comprises a water vapor-electric power generation unit with a steam-generating unit (2), water vapor turbine (3) and generator (4), and an exhaust-heat utilizing cooling-heating electric power generating unit with an absorption refrigerator (9), operating medium steam generation unit (6), operating medium steam turbine (7) and generator (8).

USE

Used as a power source for motor vehicles.

ADVANTAGE

The exhaust-heat utilizing hydrogen-oxygen system manufactures liquid hydrogen and oxygen, without ejection of carbon dioxide.

DESCRIPTION OF DRAWING

The figure shows the structure of the exhaust-heat utilizing hydrogen-oxygen system. (Drawing includes non-English language text).

Water vapor-electric path generating unit 1
 Steam generating unit 2

Water vapor turbine 3
 Generator 4,8
 Exhaust-heat utilizing cooling-heating electric power generation unit 5
 Operating medium steam generating unit 6
 Operating medium steam turbine 7
 Absorption refrigerator 9
 Water-electrolysis unit 10
 Heat exchanger 11,15
 Oxygen liquefier 12
 Water purifier 13
 Liquid oxygen storage tank 14
 Pure hydrogen liquefier 16
 Nitrogen re-liquefier 17
 Liquid hydrogen storage tank 18
 Coolant 23
 Pure water 25
 Liquid oxygen 27,29
 Hydrogen gas 30,34
 Liquid nitrogen 31
 Liquid hydrogen 33,35

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TECHNOLOGY FOCUS

Mechanical Engineering - Preferred Components: The water vapor-electric power generating unit (1) comprises a steam generating unit which produces electric power and water vapor, carbon dioxide liquefier which liquefies carbon dioxide generated by combustion of fossil fuel, biomass fuel or waste material fuel in the presence of oxygen, and liquid carbon dioxide storage tank for storing liquefied carbon dioxide.

The hydrogen-oxygen system comprises heat generator which heat pure water of unit (10), using steam from the steam turbine.

The oxygen liquefier is equipped with a heat exchanger (11) which recovers heat from the coolant for compressing oxygen gas with a compressor.

The nitrogen re-liquefier is equipped with a heat exchanger (15) which recovers heat from the coolant for compressing nitrogen gas with a compressor.

The hydrogen liquefier is equipped with a heat exchanger which recovers heat from the coolant for compressing hydrogen gas with a compressor.

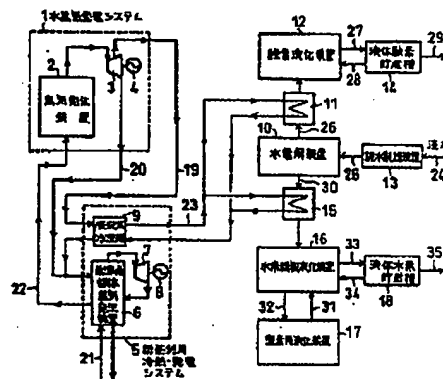
Preferred Process: The ultra-low warming-cooling medium supplying

cycle in the hydrogen-oxygen system pressurizes and cools liquid hydrogen.

The oxygen liquefier pressurizes one portion of liquid oxygen and produces liquefied oxygen gas. The nitrogen re-liquefier pressurizes composition of liquid nitrogen and produces liquefied nitrogen gas.

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